

REMARKS

Applicant hereby replies to the Office Action dated October 15, 2010. Applicant thanks the Examiner for carefully considering the application.

Status of Claims

Claims 1, 3-13, 16-27, 29-33, and 37-38 are pending in the above-referenced patent application. Claims 1, 31, and 32 are independent.

Claims 1, 3-27, 29-36 were rejected under 35 U.S.C. § 112 as failing to comply with the written description requirement. Claims 31, 32, 35-38, and 40-41 were rejected under 35 U.S.C. § 112 as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicant regards as the invention. Claims 1, 3-8, 11-41 were rejected under 35 U.S.C. § 103(a) as being unpatentable over prior art.

Claim Amendments

Claims 1, 3, 16-17, 31, and 32 are amended for clarification. Claims 14-15, 34-36, and 39-41 are canceled. No new matter is added.

Rejections under 35 U.S.C. §112 – Claims 1, 3-27, 29-41

Following the Office Action's recommendation, Applicant has removed from the claims the requirement of "substantially all" of the working solution remaining in the liquid phase and the requirement of "not in vapor phase," and canceled the claims which require preheating the working solution to "at least 151°C" and the claims which require "relatively large pieces of wood."

Therefore, withdrawal of rejections under this basis is respectfully requested.

Rejections under 35 U.S.C. §103(a) – Claims 1, 3, 6-8, 11-24 & 31-41

Claims 1, 3, 6-8, 11-24, and 31-41 were rejected under 35 U.S.C. §103(a) as being obvious over EP 0680810 A1 ("EP 810") in view of admitted state in the art (ASA) and "Boiling." Applicant respectfully traverses these rejections because, for at least the following

reasons, EP 810 does not disclose all of the claimed limitations described in the current application.

There are two significant differences between EP 810 and the current application. The first is that in EP 810, the wood impregnation step is separate from acetylation step, and in the acetylation step, no pressure is applied. As described on p.3, lines 20-21 and further supported by the accompanying drawing in Fig., the wood impregnation step of EP 810 is performed by using a pressure in the range of 2-15 bar or a vacuum after the addition of acetic anhydride solution to the wood. Subsequent to the impregnation process, the acetylation reaction in the wood can be carried out in two alternative options: (1) the wood is first surrounded with hot liquid acetic anhydride, and afterwards drained of excessive acetic anhydride; or (2) the wood is first drained of excessive acetic anhydride, and afterwards heated. See EP 810, p. 3, lines 24-28; Fig. Under either option, the acetylation reaction step subsequent to the impregnation step in EP 810 does not employ the use of elevated pressure. See EP 810, p. 3, lines 24-33; Fig.

In contrast, the wood impregnation step and the acetylation reaction step in the current application occur aggressively and simultaneously in one step, in which elevated pressure is maintained during the acetylation reaction step. Independent claim 1 requires, in part,

- b. contacting a wood or wood based material with the working solution at said super hot temperature and *at an elevated pressure* such that the working solution is maintained in the liquid phase, to cause impregnation of the liquid phase solution into the wood or wood based material (emphasis added);

independent claim 31 requires, in part,

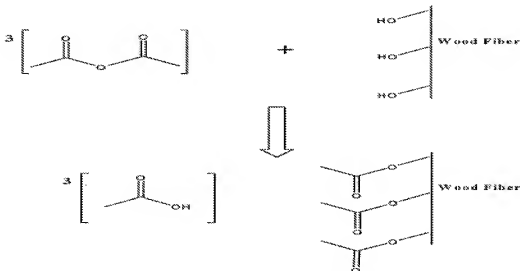
- c. contacting a wood or wood based material with the working solution at said super hot temperature and *said elevated pressure* to cause impregnation of the solution into the wood or wood based material;
- d. *applying further working pressure* to assist the impregnation of the working solution into the wood or wood based material (emphasis added);

and independent claim 32 requires, in part,

- b. contacting a wood or wood based material with the working solution at said super hot temperature and at *said elevated pressure* to cause impregnation of the solution into the wood or wood based material (emphasis added).

The requirement to maintain elevated pressure during the acetylation reaction step is supported by the specification. See p. 3, lines 22-25; p. 7, lines 12-26. The specification describes in great detail, that

“[P]referably, once a desired pressure for maintaining the super hot working solution in a liquid phase has been attained, *the pressure and/or temperature are held for a time sufficient to ensure reaction of the working solution within the wood or wood based product*. The longer pressure is maintained, the greater the uptake of the working solution by the wood or wood based product. *The term ‘reaction’ refers to any process which locks the working solution or part thereof within the wood or wood based product and may occur by biological, chemical or physical mechanisms*. For example, when a working solution of acetic anhydride enters wood, it undergoes *substitution reaction* below:



The acetyl group of acetic anhydride *replaces* the hydroxyl group of wood fibers with the formation of acetic acid by-product. The larger size of the acetyl group, compared to the hydroxyl group it replaces, causes swelling of the wood which improves the properties of the wood, for example by reducing the moisture uptake of the wood (emphasis added).”
See p. 8, lines 1-14.

Therefore, in contrast to the teaching of EP 810 in which no pressure is applied during the acetylation reaction step, the current application requires elevated pressure to be maintained during the acetylation reaction step to ensure a rapid and aggressive one step impregnation/acetylation reaction to take place.

The second significant difference between EP 810 and the current application is that in

EP 810, after the acetylation reaction time is completed, the non-reacted acetic anhydride and by-product acetic acid are removed from the wood in a two-step method of (1) applying a final vacuum, preferably with further heating at the temperature used for the acetylation reaction, followed by (2) a steam or water treatment under atmospheric pressure, vacuum, and/or pressure. See EP 810, p. 3, lines 34-42; Fig. In contrast, the current application does not employ the method taught in EP 810. Instead, after the impregnation/acetylation reaction step is completed, the remaining non-reacted acetylating agent, waste material, and by-products are separated from the wood by (1) maintaining the elevated pressure in the reaction vessel during the separation and drainage of the working solution, followed by (2) releasing the pressure to cause the remaining by-products to boil off. See p. 9, lines 9-13; p. 3, lines 29-30; p. 4, lines 24-27; p. 10, lines 21-22.

Independent claim 1 now requires, in part,

- c. separating the wood or wood based material and any remaining working solution, waste material and/or by-products, *whilst maintaining the elevated pressure*; and
- d. *releasing pressure to separate pressure kickback, the pressure kickback being any remaining working solution, waste materials, and by-products* (emphasis added);

independent claim 31 now requires, in part,

- e. separating the wood or wood based material and any remaining working solution, waste material and/or by-products, *whilst maintaining the working pressure*; and
- f. reducing the pressure to remove any further working solution, waste material and/or by-products, *which create a pressure kickback* (emphasis added);

and independent claim 32 now requires, in part,

- e. separating the wood or wood based material and any remaining working solution, waste material and/or by-products, *whilst maintaining the elevated pressure*;
- d. *releasing pressure to separate pressure kickback, the pressure kickback being any remaining working solution, waste materials, and by-products* (emphasis added);

The amendments to the independent claims are supported by the specification. The specification explains that the term “kickback” refers to remaining working solution, typical waste materials, and reaction by-products, which may include naturally occurring wood sugars,

hemicelluloses, saccharides and extractives, such as resin and fatty acids, and other molecules present in the wood, which are carried back out of the wood. See p. 9, lines 5-13. Kickback may occur during the release of pressure ("pressure kickback") or during the application of vacuum ("vacuum kickback"). See p. 9, lines 13-15. The specification describes that where the working solution comprises acetic anhydride, the pressure kickback contains a mixture of acetic anhydride, acetic acid, and wood extractives, and is typically colored red or brown. On the other hand, the vacuum kickback is colorless due to vaporization condensation of acetic acid rather than liquid flow. See p. 9, lines 22-27.

The specification explains that by draining the working solution after contact with the wood (i.e., the simultaneous impregnation/acetylation reaction step) while maintaining a working pressure, the extractives and by-product contamination are reduced. See p. 9, lines 17-19; p. 10, lines 21-22.

Further, once the working solution has been drained from the second vessel (reaction vessel), a vacuum may also be drawn through a condenser in the second vessel to facilitate the removal of further unreacted working solution from within the wood or wood based product together with any reaction by-products formed. See p. 9, lines 19-22. Thus, the dependent claim 16 now reads,

The process as claimed in claim 1 including applying a vacuum to separate any remaining working solution, waste material and/or by-products *which create a vacuum kickback* (emphasis added).

Based on all of the above, Applicant respectfully submits that in contrast to the current application, EP 810 does not teach: (1) an aggressive and simultaneous wood impregnation/acetylation reaction step, in which elevated pressure is maintained during the acetylation reaction step; and (2) a removal of the remaining non-reacted acetylating agent, waste material, and by-products from the wood by maintaining the elevated pressure in the reaction vessel during the separation and drainage of the working solution, followed by releasing the pressure to cause the remaining by-products to boil off. Therefore, it would not have been obvious to a person having ordinary skill in the art to appreciate and reap the benefits of the process claimed in the current application.

CONCLUSION

In view of the foregoing amendments and remarks, Applicant believes that the claims are in condition for allowance. Reconsideration, re-examination, and allowance of all claims are respectfully requested. If the Examiner feels that a telephone interview may help further the examination of the present application, the Examiner is encouraged to call the undersigned attorney or his associates at the telephone number listed below.

Please direct all correspondence to **Innovation Capital Law Group, LLP**, 19900 MacArthur Blvd., Suite 1150, Irvine, California 92612.

Respectfully submitted,

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